

United States Department of Agriculture Natural Resources Conservation Service

Ecological Site Description

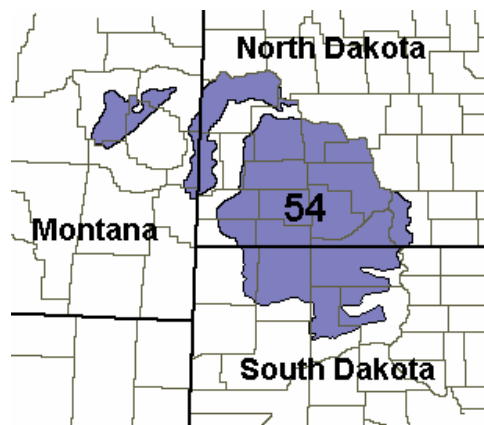
Site Name: Thin Claypan

Site Type: Rangeland

Site ID: R054XY033ND

Major Land Resource Area (MLRA): 54 – Rolling Soft Shale Plain

For more information on MLRA's refer to the following web site: http://www.essc.psu.edu/soil_info/soil_lrr/.



Physiographic Features

This site occurs on gently undulating to rolling sedimentary uplands.

Landform: alluvial fan, alluvial flat, hill, and knoll **Aspect:** NA

	<u>Minimum</u>	<u>Maximum</u>
Elevation (feet):	1600	3600
Slope (percent):	0	25
Water Table Depth (inches):	48	>72
Flooding:		
Frequency:	None	None
Duration:	None	None
Ponding:		
Depth (inches):	None	None
Frequency:	None	None
Duration:	None	None
Runoff Class:	Medium	High

Climatic Features

MLRA 54 is considered to have a continental climate – cold winters and hot summers, low humidity, light rainfall, and much sunshine. Extremes in temperature are characteristic. The climate is the result of this MLRA's location in the geographic center of North America. There are few natural barriers on the northern Great Plains. The air masses move unobstructed across the plains and account for rapid changes in temperature.

Annual precipitation ranges from 14 to 18 inches per year. The normal average annual temperature is about 42°F. January is the coldest month with average temperatures ranging from about 13°F (Beach, North Dakota (ND),) to about 16°F (Bison, South Dakota (SD)). July is the warmest month with temperatures averaging from about 69°F (Beach, ND,) to about 72°F (Timber Lake, SD). The range of normal average monthly temperatures between the coldest and warmest months is about 57°F. This large annual range attests to the continental nature of this MLRA's climate. Hourly winds are estimated to average about 11 miles per hour annually, ranging from about 13 miles per hour during the spring to about 10 miles per hour during the summer. Daytime winds are generally

stronger than nighttime and occasional strong storms may bring brief periods of high winds with gusts to more than 50 miles per hour.

Growth of native cool-season plants begins in late March and continues to early to mid July. Native warm-season plants begin growth in mid May and continue to the end of August. Green up of cool-season plants can occur in September and October when adequate soil moisture is present.

	<u>Minimum</u>	<u>Maximum</u>
Frost-free period (days):	119	136
Freeze-free period (days):	139	157
Mean Annual Precipitation (inches):	14	18

Average Monthly Precipitation (inches) and Temperature (°F):

	Precip. Min.	Precip. Max	Temp. Min.	Temp. Max.
January	0.41	0.54	2.2	23.8
February	0.37	0.61	8.7	30.4
March	0.51	1.07	17.1	40.0
April	1.13	1.88	28.9	56.8
May	1.98	2.83	40.5	69.3
June	2.83	3.29	49.8	78.3
July	2.05	2.25	54.6	85.2
August	1.49	2.07	53.0	84.3
September	1.29	1.45	42.0	73.4
October	0.89	1.35	31.6	60.4
November	0.48	0.61	19.0	41.5
December	0.42	0.55	8.1	29.0

Climate Stations		Period	
Station ID	Location or Name	From	To
ND0590	Beach	1949	1999
MT7560	Sidney	1949	1999
SD8307	Timber Lake	1948	1999
ND2183	Dickinson FAA AP	1948	1999

For local climate stations that may be more representative, refer to <http://www.wcc.nrcs.usda.gov>.

Influencing Water Features

No significant water features influence this site.

Representative Soil Features

The common features of soils in this site are the fine sandy loam to clay textured subsoils and slopes of 0 to 25 percent. The soils in this site are moderately well to well drained and formed in soft sandstone, siltstone, shales, and alluvium. The fine sandy loam to clay loam surface layer is two to six inches thick. The extremely hard clayey Btn horizon has round-topped or “bun shaped” columnar or prismatic structured subsoil. These Btn horizons are high in sodium. The soils have a moderate to slow infiltration rate and very slow saturated hydraulic conductivity. Wet surface compaction can occur with heavy traffic. Waterflow paths are broken, irregular in appearance or discontinuous with numerous debris dams or vegetative barriers, and there is a high risk of rills and eventually gullies if vegetative cover is not adequate. Cryptobiotic crusts are present and a moderate pedestalling of plants occurs.

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MLRA: 54 – Rolling Soft Shale Plain

Thin Claypan
R054XY033ND

These soils are mainly susceptible to water erosion. The hazard of water erosion greatly increases on slopes greater than about nine percent. Loss of the soil surface layer can result in a shift in species composition and/or production.

Major soil series correlated to this ecological site can be found in Section II of the Natural Resources Conservation Service (NRCS) Field Office Technical Guide or the following web sites:

North Dakota: <http://www.nd.nrcs.usda.gov>.

South Dakota: <http://www.sd.nrcs.usda.gov>.

Montana: <http://www.mt.nrcs.usda.gov>.

Parent Material Kind: alluvium and residuum

Parent Material Origin: sandstone, shale

Surface Texture: silt loam, loam, fine sandy loam

Surface Texture Modifier: none

Subsurface Texture Group: clayey

Surface Fragments ≤ 3" (% Cover): 0

Surface Fragments > 3" (%Cover): 0

Subsurface Fragments ≤ 3" (% Volume): 0-20

Subsurface Fragments > 3" (% Volume): 0-10

	<u>Minimum</u>	<u>Maximum</u>
Drainage Class:	moderately well	well
Permeability Class:	very slow	slow
Depth to first restrictive layer (inches):	6	16
Electrical Conductivity (mmhos/cm)*:	8	16
Sodium Absorption Ratio*:	13	30
Soil Reaction (1:1 Water)*:	5.1	9.5
Soil Reaction (0.1M CaCl₂)*:	NA	NA
Available Water Capacity (inches)*:	1	3
Calcium Carbonate Equivalent (percent)*:	0	10

* - These attributes represent from 0-40 inches or to the first restrictive layer.

Plant Communities

Ecological Dynamics of the Site:

The site developed under Northern Great Plains climatic conditions, and included natural influence of large herbivores and occasional fire. Changes will occur in the plant communities due to management actions and/or climatic conditions. Due to the nature of the soils, the site is considered quit fragile. Under continued adverse impacts, a rapid decline in vegetative vigor and composition will occur. Under favorable vegetative management treatments the site can slowly return to the HCPC.

The plant community upon which the interpretations are primarily based is the HCPC. The HCPC has been determined by study of rangeland relic areas, areas protected from excessive disturbance, and areas under long-term rotational grazing regimes. Trends in plant community dynamics ranging from heavily grazed to lightly grazed areas, seasonal use pastures, and historical accounts also have been considered. Subclimax plant communities, states, transitional pathways, and thresholds have been determined through similar studies and experience.

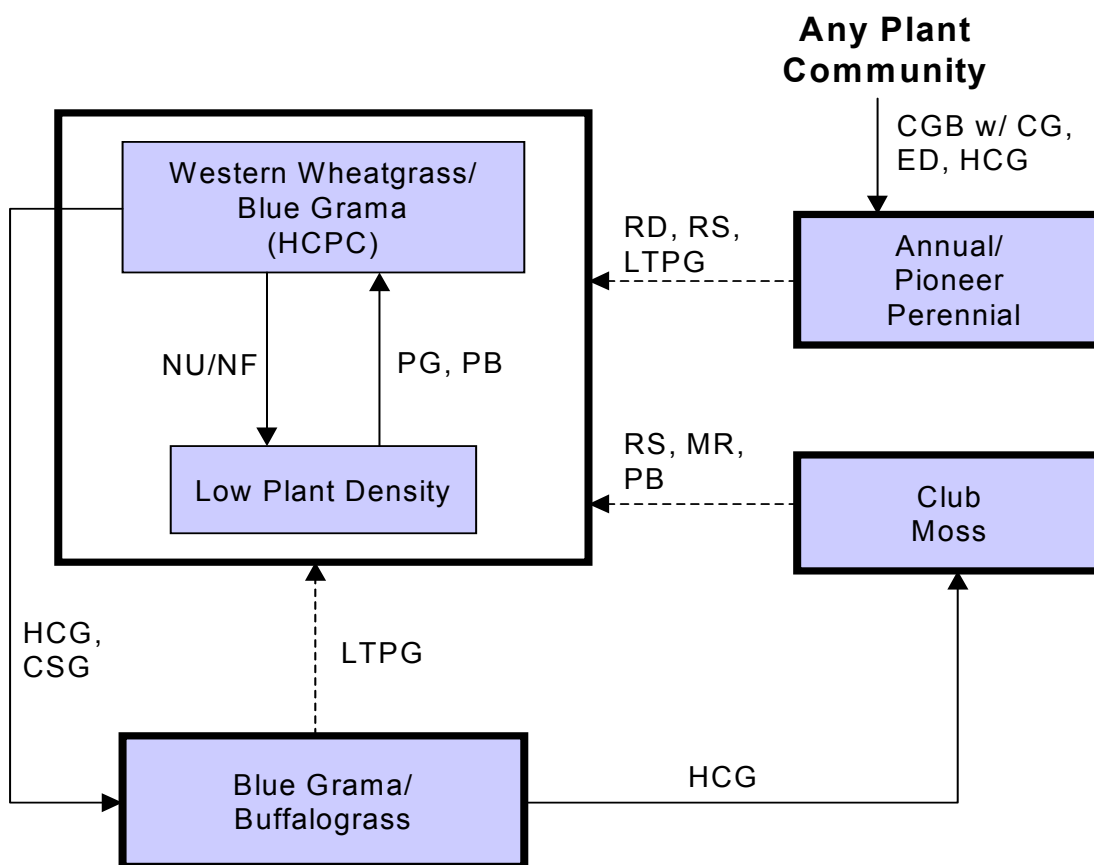
Continuous grazing without adequate recovery periods following each grazing occurrence over several years causes this site to depart from the HCPC. Species such as blue grama, Sandberg bluegrass, and inland saltgrass will increase. Western wheatgrass and prairie junegrass will decrease in frequency and production. In time, heavy continuous grazing will likely cause blue grama to

dominate and pioneer perennials, annuals, and club moss (in its range) to increase. This plant community is relatively stable and the competitive advantage prevents other species from establishing. This plant community is less productive than the HCPC. Runoff increases and infiltration will decrease. Soil erosion will be minimal.

Extended periods of non-use and/or lack of fire will result in a plant community having low density, which favors an increase in Sandberg bluegrass, and in time, shrubs such as cactus.

The following diagram illustrates the common plant communities and vegetation states commonly occurring on the site and the transition pathways between communities and states. The ecological processes will be discussed in more detail in the plant community descriptions following the diagram.

Plant Communities and Transitional Pathways



CGB w/ CG - cropped go-back with continuous grazing; **CSG** - continuous seasonal grazing; **ED** - excessive defoliation; **HCPC** - Historic Climax Plant Community; **HCG** - heavy continuous grazing; **LTPG** - long-term prescribed grazing; **MR** - mechanical renovation with prescribed grazing; **NU/NF** - extended period of non-use & no fire; **PB** - prescribed burning, followed by prescribed grazing; **PG** - prescribed grazing; **RS** - range seeding with prescribed grazing; **RD** - removal of disturbance.

Plant Community Composition and Group Annual Production

		Western Wheatgrass/ Blue Grama (HCPC)		
COMMON/GROUP NAME	SYMBOL	Group	lbs./acre	% Comp
GRASSES & GRASS-LIKES			765 - 855	85 - 95
		1	180 - 270	20 - 30
western wheatgrass	PASM	1	180 - 270	20 - 30
thickspike wheatgrass	ELLAL	1	0 - 90	0 - 10
		2	180 - 270	20 - 30
blue grama	BOGR2	2	135 - 225	15 - 25
buffalograss	BUDA	2	9 - 45	1 - 5
		3	45 - 126	5 - 14
needleandthread	HECOC8	3	9 - 45	1 - 5
Sandberg bluegrass	POSE	3	9 - 45	1 - 5
prairie junegrass	KOMA	3	9 - 45	1 - 5
OTHER NATIVE GRASSES		4	18 - 45	2 - 5
plains reedgrass	CAMO	4	0 - 18	0 - 2
inland saltgrass	DISP	4	9 - 45	1 - 5
green needlegrass	NAVI4	4	0 - 18	0 - 2
tumblegrass	SCPA	4	0 - 18	0 - 2
dropseed	SPORO	4	0 - 18	0 - 2
other native perennial	2GP	4	9 - 45	1 - 5
other native annual	2GA	4	0 - 9	0 - 1
GRASS-LIKES		5	18 - 45	2 - 5
needleleaf sedge	CADU6	5	9 - 45	1 - 5
threadleaf sedge	CAFI	5	9 - 18	1 - 2
other grass-likes	2GL	5	0 - 27	0 - 3
FORBS		6	63 - 90	7 - 10
cudweed sagewort	ARLU	6	0 - 9	0 - 1
heath aster	SYER	6	9 - 18	1 - 2
Hood's phlox	PHHO	6	0 - 9	0 - 1
Lambert crazyweed	OXLA3	6	9 - 18	1 - 2
Nuttall's violet	VINU2	6	9 - 9	1 - 1
prairie coneflower	RACO3	6	9 - 18	1 - 2
rose pussytoes	ANRO2	6	9 - 9	1 - 1
rush skeletonweed	LYJU	6	9 - 9	1 - 1
scarlet globemallow	SPCO	6	9 - 9	1 - 1
silverleaf scurfpea	PEAR6	6	9 - 18	1 - 2
sticky cinquefoil	POGL9	6	9 - 9	1 - 1
wavyleaf thistle	CIUN	6	0 - 9	0 - 1
western yarrow	ACMI2	6	9 - 18	1 - 2
wild onion	ALLIU	6	9 - 9	1 - 1
wild parsley	MUDI	6	9 - 9	1 - 1
woolly Indianwheat	PLPA2	6	9 - 9	1 - 1
native annual/biennial forbs	2FORB	6	0 - 18	0 - 2
native perennial forbs	2FP	6	0 - 18	0 - 2
SHRUBS		7	9 - 45	1 - 5
brittle cactus	OPFR	7	9 - 18	1 - 2
broom snakeweed	GUSA2	7	9 - 9	1 - 1
fringed sagewort	ARFR4	7	9 - 18	1 - 2
Nuttall's saltbush	ATNU2	7	9 - 18	1 - 2
plains pricklypear	OPPO	7	0 - 18	0 - 2
purple pincushion	ESVIV	7	0 - 9	0 - 1
rubber rabbitbrush	ERNA10	7	0 - 9	0 - 1
silver sagebrush	ARCA13	7	0 - 9	0 - 1
winterfat	KRLA2	7	0 - 9	0 - 1
other shrubs	2SHRUB	7	0 - 18	0 - 2
CRYPTOGAMS		8	0 - 9	0 - 1
clubmoss	SEDE2	8	0 - 9	0 - 1
Annual Production lbs./acre		LOW RV HIGH		
GRASSES & GRASS-LIKES		435 - 792 - 1045		
FORBS		60 - 77 - 95		
SHRUBS		5 - 27 - 50		
CRYPTOGAMS		0 - 5 - 10		
TOTAL		500 - 900 - 1200		

This list of plants and their relative proportions are based on near normal years. Fluctuations in species composition and relative production may change from year to year dependent upon precipitation or other climatic factors. RV = Representative Value.

Plant Community Composition and Group Annual Production

		Western Wheatgrass/ Blue Grama (HCPC)			Blue Grama/Buffalograss			Low Plant Density			Club Moss		
COMMON/GROUP NAME	SYMBOL	Grp	lbs./acre	% Comp	Grp	lbs./acre	% Comp	Grp	lbs./acre	% Comp	Grp	lbs./acre	% Comp
GRASSES & GRASS-LIKES		1	680 - 760	85 - 95		200 - 225	80 - 90		553 - 618	85 - 95		140 - 170	70 - 85
		1	160 - 240	20 - 30	1	25 - 38	10 - 15	1	98 - 163	15 - 25	1	10 - 20	5 - 10
western wheatgrass	PASM	1	160 - 240	20 - 30	1	25 - 38	10 - 15	1	98 - 163	15 - 25	1	10 - 20	5 - 10
thickspike wheatgrass	ELLAL	1	0 - 80	0 - 10	1	0 - 13	0 - 5	1	0 - 65	0 - 10	1	0 - 10	0 - 5
		2	160 - 240	20 - 30	2	75 - 88	30 - 35	2	65 - 98	10 - 15	2	70 - 80	35 - 40
blue grama	BOGR2	2	120 - 200	15 - 25	2	63 - 88	25 - 35	2	65 - 98	10 - 15	2	60 - 80	30 - 40
buffalograss	BUDA	2	8 - 40	1 - 5	2	13 - 25	5 - 10	2	7 - 33	1 - 5	2	10 - 20	5 - 10
		3	40 - 112	5 - 14	3	38 - 50	15 - 20	3	65 - 98	10 - 15	3	10 - 20	5 - 10
needleandthread	HECOC8	3	8 - 40	1 - 5	3	13 - 25	5 - 10	3	65 - 98	10 - 15	3	4 - 14	2 - 7
Sandberg bluegrass	POSE	3	8 - 40	1 - 5	3	25 - 38	10 - 15	3	33 - 65	5 - 10	3	10 - 20	5 - 10
prairie junegrass	KOMA	3	8 - 40	1 - 5	3	3 - 5	1 - 2	3	20 - 33	3 - 5	3	4 - 6	2 - 3
OTHER NATIVE GRASSES		4	16 - 40	2 - 5	4	8 - 18	3 - 7	4	13 - 33	2 - 5	4	10 - 18	5 - 9
plains reedgrass	CAMO	4	0 - 16	0 - 2	4	0 - 3	0 - 1	4	0 - 13	0 - 2	4	0 - 2	0 - 1
inland saltgrass	DISP	4	8 - 40	1 - 5	4	8 - 13	3 - 5	4	7 - 20	1 - 3	4	6 - 18	3 - 9
green needlegrass	NAV4	4	0 - 16	0 - 2				4	0 - 13	0 - 2			
tumblegrass	SCPA	4	0 - 16	0 - 2	4	0 - 3	0 - 1	4	0 - 13	0 - 2	4	0 - 2	0 - 1
dropseed	SPORO	4	0 - 16	0 - 2	4	5 - 8	2 - 3	4	0 - 13	0 - 2	4	2 - 10	1 - 5
other native perennial	2GP	4	8 - 40	1 - 5	4	0 - 5	0 - 2	4	7 - 33	1 - 5	4	0 - 4	0 - 2
other native annual	2GA	4	0 - 8	0 - 1	4	0 - 3	0 - 1	4	0 - 7	0 - 1	4	0 - 6	0 - 3
GRASS-LIKES		5	16 - 40	2 - 5	5	3 - 3	1 - 1	5	33 - 65	5 - 10	5	2 - 2	1 - 1
needleleaf sedge	CADU6	5	8 - 40	1 - 5	5	3 - 3	1 - 1	5	26 - 52	4 - 8	5	2 - 2	1 - 1
threadleaf sedge	CAFI	5	8 - 16	1 - 2	5	0 - 3	0 - 1	5	0 - 7	0 - 1	5	0 - 2	0 - 1
other grass-likes	2GL	5	0 - 24	0 - 3	5	0 - 3	0 - 1	5	0 - 20	0 - 3	5	0 - 2	0 - 1
NON-NATIVE GRASSES		6			6			6	46 - 91	7 - 14	6		
bluegrass	POA							6	33 - 65	5 - 10			
smooth brome	BRIN2							6	0 - 20	0 - 3			
crested wheatgrass	AGCR							6	0 - 20	0 - 3			
cheatgrass	BRTE							6	0 - 26	0 - 4			
FORBS		7	56 - 80	7 - 10	7	13 - 25	5 - 10	7	46 - 65	7 - 10	7	10 - 20	5 - 10
cudweed sagewort	ARLU	7	0 - 8	0 - 1	7	3 - 8	1 - 3	7	7 - 13	1 - 2	7	4 - 6	2 - 3
curlycup gumweed	GRSQ				7	5 - 13	2 - 5				7	0 - 4	0 - 2
heath aster	SYER	7	8 - 16	1 - 2	7	8 - 13	3 - 5	7	7 - 13	1 - 2	7	6 - 10	3 - 5
Hood's phlox	PHHO	7	0 - 8	0 - 1	7	0 - 3	0 - 1	7	0 - 7	0 - 1	7	0 - 2	0 - 1
Lambert crazyweed	OKLA3	7	8 - 16	1 - 2	7	5 - 13	2 - 5	7	7 - 13	1 - 2	7	4 - 6	2 - 3
Nuttall's violet	VINU2	7	8 - 8	1 - 1	7	0 - 3	0 - 1	7	7 - 7	1 - 1	7	0 - 2	0 - 1
prairie coneflower	RACO3	7	8 - 16	1 - 2	7	8 - 13	3 - 5	7	7 - 13	1 - 2	7	6 - 10	3 - 5
rose pussytoes	ANRO2	7	8 - 8	1 - 1	7	5 - 8	2 - 3	7	7 - 7	1 - 1	7	2 - 4	1 - 2
rush skeletonweed	LYJU	7	8 - 8	1 - 1	7	5 - 8	2 - 3	7	7 - 7	1 - 1	7	0 - 2	0 - 1
scarlet globemallow	SPCO	7	8 - 8	1 - 1	7	5 - 8	2 - 3	7	7 - 7	1 - 1	7	4 - 6	2 - 3
silverleaf scurfpea	PEAR6	7	8 - 16	1 - 2	7	5 - 8	2 - 3	7	7 - 13	1 - 2	7	6 - 10	3 - 5
sticky cinquefoil	POGL9	7	8 - 8	1 - 1	7	0 - 3	0 - 1	7	7 - 7	1 - 1	7	0 - 2	0 - 1
wavyleaf thistle	CIUN	7	0 - 8	0 - 1	7	5 - 8	2 - 3	7	0 - 7	0 - 1	7	2 - 4	1 - 2
western salsify	TRDU				7	3 - 5	1 - 2	7	0 - 7	0 - 1	7	2 - 4	1 - 2
western yarrow	ACMI2	7	8 - 16	1 - 2	7	8 - 13	3 - 5	7	7 - 13	1 - 2	7	4 - 6	2 - 3
wild onion	ALLIU	7	8 - 8	1 - 1	7	3 - 5	1 - 2	7	7 - 7	1 - 1	7	2 - 4	1 - 2
wild parsley	MUDI	7	8 - 8	1 - 1	7	0 - 3	0 - 1	7	7 - 7	1 - 1	7	2 - 4	1 - 2
woolly Indianwheat	PLPA2	7	8 - 8	1 - 1	7	3 - 5	1 - 2	7	7 - 7	1 - 1	7	4 - 6	2 - 3
native annual/biennial forbs	2FORB	7	0 - 16	0 - 2	7	3 - 5	1 - 2	7	0 - 13	0 - 2	7	4 - 6	2 - 3
native perennial forbs	2FP	7	0 - 16	0 - 2	7	0 - 5	0 - 2	7	0 - 13	0 - 2	7	0 - 2	0 - 1
non-native forbs	2FORB				7	0 - 13	0 - 5	7	33 - 65	5 - 10	7	0 - 6	0 - 3
SHRUBS		8	8 - 40	1 - 5	8	13 - 25	5 - 10	8	7 - 33	1 - 5	8	10 - 20	5 - 10
brittle cactus	OPFR	8	8 - 16	1 - 2	8	10 - 15	4 - 6	8	7 - 13	1 - 2	8	4 - 8	2 - 4
broom snakeweed	GUSA2	8	8 - 8	1 - 1	8	8 - 18	3 - 7	8	7 - 7	1 - 1	8	4 - 6	2 - 3
fringed sagewort	ARFR4	8	8 - 16	1 - 2	8	18 - 20	7 - 8	8	7 - 13	1 - 2	8	6 - 14	3 - 7
Nuttall's saltbush	ATNU2	8	8 - 16	1 - 2	8	0 - 3	0 - 1	8	0 - 13	0 - 2	8	0 - 2	0 - 1
plains pricklypear	OPPO	8	0 - 16	0 - 2	8	0 - 8	0 - 3	8	0 - 13	0 - 2	8	4 - 8	2 - 4
purple pincushion	ESVIV	8	0 - 8	0 - 1	8	0 - 3	0 - 1	8	0 - 7	0 - 1	8	0 - 2	0 - 1
rubber rabbitbrush	ERNA10	8	0 - 8	0 - 1	8	5 - 13	2 - 5	8	0 - 13	0 - 2	8	0 - 6	0 - 3
silver sagebrush	ARCA13	8	0 - 8	0 - 1	8	0 - 10	0 - 4	8	0 - 7	0 - 1	8	0 - 10	0 - 5
winterfat	KRLA2	8	0 - 8	0 - 1	8	0 - 3	0 - 1	8	0 - 7	0 - 1	8	0 - 2	0 - 1
other shrubs	2SHRUB	8	0 - 16	0 - 2				8	0 - 13	0 - 2	8	2 - 4	1 - 2
CRYPTOGAMS		9	0 - 8	0 - 1	9	3 - 5	1 - 2	9	0 - 7	0 - 1	9	10 - 20	5 - 10
clubmoss	SEDE2	9	0 - 8	0 - 1	9	3 - 5	1 - 2	9	0 - 7	0 - 1	9	10 - 20	5 - 10
Annual Production lbs./acre			LOW	RV	HIGH		LOW	RV	HIGH		LOW	RV	HIGH
GRASSES & GRASS-LIKES			340 - 704	-1080		130 - 209	-280		310 - 572	-885		135 - 155	-225
FORBS			55 - 68	-85		10 - 19	-30		40 - 55	-70		5 - 15	-25
SHRUBS			5 - 24	-45		10 - 19	-30		0 - 20	-35		5 - 15	-25
CRYPTOGAMS			0 - 4	-10		0 - 4	-10		0 - 3	-10		5 - 15	-25
TOTAL			400 - 800	-1200		150 - 250	-350		350 - 650	-1000		150 - 200	-300

This list of plants and their relative proportions are based on near normal years. Fluctuations in species composition and relative production may change from year to year dependent upon precipitation or other climatic factors. RV = Representative value.

Plant Community and Vegetation State Narratives

Following are the narratives for each of the described plant communities. These plant communities may not represent every possibility, but they are the most prevalent and repeatable plant communities. The plant composition tables shown above have been developed from the best available knowledge at the time of this revision. As more data are collected, some of these plant communities may be revised or removed, and new ones may be added. None of these plant communities should necessarily be thought of as “Desired Plant Communities” (DPC). According to the USDA NRCS National Range and Pasture Handbook, DPC’s will be determined by the decision-makers and will meet minimum quality criteria established by the NRCS. The main purpose for including any description of a plant community here is to capture the current knowledge and experience at the time of this revision.

Western Wheatgrass/Blue Grama Plant Community

This is the interpretive plant community for this site, and it is also considered the HCPC. This site evolved with grazing by large herbivores and occasional prairie fires. This plant community can be found on areas having a history of proper grazing management, including adequate recovery periods between grazing events. The potential vegetation is about 84 percent grasses or grass-like plants, 10 percent forbs, 5 percent shrubs, and 1 percent cryptogams. Cool season grasses dominate the site, but warm season short grasses are also prevalent. The co-dominant grasses are western wheatgrass and blue grama. Other grasses and grass-like plants occurring on the site include needleandthread, buffalograss, Sandberg bluegrass, and sedges. Significant forbs may include prairie coneflower, scarlet globemallow, Lambert’s crazyweed, and western yarrow. In other areas, silver sagebrush is the dominant shrub and occurs more evenly dispersed across the site. Other shrubs include Nuttall’s saltbush, broom snakeweed, brittle cactus, and fringed sagewort.

This plant community is well adapted to the Northern Great Plains climatic conditions. Individual species can vary greatly in production depending on growing conditions (timing and amount of precipitation and temperature). Community dynamics, nutrient cycle, water cycle, and energy flow are functioning properly. Plant litter is properly distributed with some movement offsite and natural plant mortality is low. The diversity in plant species allows for some drought tolerance. This is a fragile, but sustainable plant community. Low to moderate available water capacity coupled with high accumulations of sodium and slow permeability strongly influences the soil-water-plant relationships.

The following growth curve is an estimate of the monthly percentages of total annual growth of the dominant species expected during a normal year:

Growth curve number: ND5402

Growth curve name: Missouri Slope, Native Grasslands, Cool/Warm-season Mix.

Growth curve description: Cool-season/Warm-season dominant.

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
0	0	2	6	21	40	20	6	4	1	0	0

Transitional pathways and/or community pathways leading to other plant communities are as follows:

- Non-use and no fire for extended periods of time will convert this plant community to the *Low Plant Density Plant Community*.
- Heavy, continuous grazing will convert the plant community to the *Blue Grama/Buffalograss Plant Community*.
- Continuous seasonal grazing (annual, early spring) will convert the plant community to the *Blue Grama/Buffalograss Plant Community*.

- Excessive defoliation (i.e., areas of heavy animal concentration) will convert the plant community to the *Annual/Pioneer Perennial Plant Community*.
- Go-back land with continuous grazing will convert this plant community to the *Annual/Pioneer Perennial Plant Community* or the *Club Moss Plant Community*.

Blue Grama/Buffalograss Plant Community

This plant community can quickly develop from the adverse effects of heavy continuous grazing and/or annual, early spring seasonal grazing. Annual grazing too early in the spring depletes stored carbohydrates, resulting in weakening and eventual death of the cool season mid-grasses. Short grasses and forbs increase to dominate the site and annual production decreases dramatically. Lack of litter and reduced vigor result in higher soil temperatures, poor water infiltration rates, and high evapotranspiration, which gives blue grama a competitive advantage over cool season mid-grasses. This plant community can occur throughout the pasture, on spot grazed areas, and around water sources where season-long grazing patterns occur.

Blue grama and buffalograss are the dominant species with the balance being a few species of cool-season grasses and warm-season grasses including buffalograss, inland saltgrass, needleandthread, prairie Junegrass, and annual grasses. Forbs such as broom snakeweed, cudweed sagewort, heath aster, and western yarrow may also be present. There is usually more than 25 percent bare ground.

This plant community is quite resilient. The thick sod and competitive advantage prevents other species from establishing. This plant community is less productive than the HCPC. Runoff increases and infiltration will decrease. Soil erosion will be minimal due to the sod forming habit of blue grama and buffalograss.

The following growth curve is an estimate of the monthly percentages of total annual growth of the dominant species expected during a normal year:

Growth curve number: ND5405

Growth curve name: Missouri Slope, Warm-season Short Grass.

Growth curve description: Warm season, short grass dominant, and some sedge.

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
0	0	1	7	18	33	26	10	4	1	0	0

Transitional pathways and/or community pathways leading to other plant communities are as follows:

- Long-term prescribed grazing that includes changing season of use and allowing adequate recovery periods to enhance cool season grasses can slowly shift this plant community back towards the *Western Wheatgrass/Blue Grama Plant Community*.
- Heavy, continuous grazing may cause further deterioration resulting in a shift to the *Club Moss Plant Community*.

Low Plant Density Plant Community

This plant community develops after an extended period of 20 or more years of non-use by herbivores and exclusion of fire. This plant community is dispersed throughout the pasture, encircling spot grazed areas, and areas distant from water sources. This is a typical pattern found in properly stocked pastures grazed season-long. Plant litter may accumulate as this plant community first develops. Due to a lack of tiller stimulation and sunlight, native bunchgrasses typically develop dead centers and native rhizomatous grasses are limited to colonies. Standing decadent plants and moderate litter covers shorter understory species (i.e., short grasses and sedges), restricting their ability to capture adequate sunlight for photosynthesis. Vigor and diversity of native plants are

reduced. Annual and/or biennial forbs, annual grasses, and cryptogams commonly fill interspaces once occupied by desirable species.

Cheatgrass and sweetclover tend to invade this plant community only when moisture conditions are favorable for these species. Sandberg bluegrass tends to increase along with needleandthread, prairie Junegrass and shrubs like broom snakeweed and brittle cactus. Other grasses present include western wheatgrass and sedges with lesser amounts of blue grama and inland saltgrass. The common forbs include Missouri goldenrod, prairie coneflower, silverleaf scurfpea, western yarrow, and heath aster. Fringed sagewort, silver sagebrush, rubber rabbitbrush, Nuttall's saltbush, broom snakeweed, and may be the principal shrubs.

This plant community is resistant to change without prescribed grazing or fire. Prescribed grazing is most effective in moving this plant community towards the HCPC. Soil erosion is low. Compared to the HCPC, infiltration is reduced to the lower root zone. Runoff is similar to the HCPC. This plant community tends to favor early cool season plant species which are moisture loving and usually tends to utilize the spring moisture quickly causing the soil to become dry and not very productive early in the summer. Once this plant community is reached, any of the preferred treatments can readily return the diversity and production of the site.

The following growth curve is an estimate of the monthly percentages of total annual growth of the dominant species expected during a normal year:

Growth curve number: ND5406

Growth curve name: Missouri Slope, Introduced Cool-season Grasses.

Growth curve description: Introduced cool-season grasses.

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
0	0	3	10	35	35	5	2	8	2	0	0

Transitional pathways and/or community pathways leading to other plant communities are as follows:

- Prescribed grazing or prescribed burning followed by prescribed grazing will move this plant community toward the *Western Wheatgrass/Blue Grama Plant Community*. This would require long-term management with prescribed grazing and/or prescribed burning under controlled conditions.
- Excessive defoliation (i.e., areas of heavy animal concentration,) will convert the plant community to the *Annual/Pioneer Perennial Plant Community*.
- Cropped go-back land with continuous grazing will convert this plant community to the *Annual/Pioneer Perennial Plant Community*.

Club Moss Plant Community

This plant community typically occurs in the western portion of MLRA 54. A dense sod of club moss dominates this plant community. Club moss occupies bare soil areas within deteriorated or disturbed higher successional plant communities due to long-term repeated disturbances. Club moss cover is often 25 percent or greater. Club moss creates a more arid microclimate, resulting in extreme competition for available moisture. Vigor and production of other species is reduced dramatically.

Blue grama, western wheatgrass, and Sandberg bluegrass are the dominant grass species with the balance being a few species of cool and warm season grasses including, inland saltgrass, buffalograss, and prairie junegrass. Sedges are typically not found. Forbs commonly found in this plant community include heath aster, Lambert's crazyweed, scarlet globemallow, scurfpea, curlycup gumweed, and western yarrow will also be present. There is usually less than 15 percent bare ground.

This plant community is very resistant to change. The thick sod and competitive advantage of both the clubmoss and the blue grama prevents other species from expanding and establishing. This plant community is far less productive than the HCPC. Initial runoff rates are low but then increase as clubmoss becomes saturated. Once clubmoss has been saturated then runoff increases and infiltration decreases as compared HCPC. Soil erosion will be minimal.

The following growth curve represents monthly percentages of total annual growth of the dominant species during a normal year:

Growth curve number: ND5404

Growth curve name: Missouri Slope, Warm-season Dominant, Cool-season Subdominant.

Growth curve description: Short warm-season dominant, mid cool-season subdominant and club moss.

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
0	0	1	5	20	38	25	8	3	0	0	0

Transitional pathways and/or community pathways leading to other plant communities are as follows:

- Mechanical renovation or range seeding, followed by prescribed grazing, will reduce club moss, increase western wheatgrass, and eventually shift this plant community back toward the *Western Wheatgrass/Blue Grama Plant Community*.
- Prescribed burning followed by prescribed grazing may eventually convert this plant community back to the *Western Wheatgrass/Blue Grama Plant Community*.
- Long-term prescribed grazing may eventually move this plant community through the successional stages leading toward the *Western Wheatgrass/Blue Grama Plant Community*.
- Excessive defoliation (i.e., areas of heavy animal concentration,) will quickly convert the plant community to the *Annual/Pioneer Perennial Plant Community*.
- Cropped go-back land with continuous grazing will convert this plant community to the *Annual/Pioneer Perennial Plant Community*.

Annual/Pioneer Perennial Plant Community

This plant community develops under severe disturbance and/or excessive defoliation. This can result from heavy livestock or wildlife concentration, and cropping abandonment (go-back land). The dominant vegetation includes pioneer annual grasses, forbs, invaders, and early successional biennial, and perennial species. Grasses may include sixweeks fescue, crested wheatgrass, annual brome grass, needleandthread, prairie Junegrass, and western wheatgrass. The dominant forbs include curlycup gumweed, kochia, pussytoes, prostrate verbena, and other early successional species. Shrubs that may be present include prairie rose, fringed sagewort, and broom snakeweed. Plant species from adjacent ecological sites may become minor components of this plant community. The community also is susceptible to invasion of non-native annual and perennial forbs due to severe soil disturbances and relatively high percent of bare ground. Compared to the HCPC, western wheatgrass, green needlegrass, needleandthread, and blue grama have decreased.

This plant community is resistant to change, as long as soil disturbance or severe vegetation defoliation persists, thus holding back secondary plant succession. Soil erosion is potentially high in this plant community. Reduced surface cover, low plant density, low plant vigor, loss of root biomass, and soil compaction, all contribute to decreased water infiltration, increased runoff, and accelerated erosion rates.

Significant economic inputs, management, and time would be required to move this plant community toward a higher successional stage and a more productive plant community. Secondary succession is highly variable, depending upon availability and diversity of a viable seed bank of higher successional species within the existing plant community and neighboring plant communities. This plant community can be renovated to improve the production capability, but management changes would be needed to maintain the new plant community. The total annual production ranges from 100 to 500 lbs./ac. (air-dry weight) depending upon growing conditions.

Transitional pathways and/or community pathways leading to other plant communities are as follows:

- Range seeding with deferment and prescribed grazing can convert this to a plant community resembling the *Western Wheatgrass/Blue Grama Plant Community*.
- Under long-term prescribed grazing and/or removal of disturbance, including adequate rest periods, this plant community will move through the successional stages, and may eventually lead to a plant community resembling the (HCPC) *Western Wheatgrass/Blue Grama Plant Community*. Depending on the slope, aspect, and size, and if adequate perennial plants exist, this change can occur more rapidly. This process will likely take a long period of time (50+ years).

Ecological Site Interpretations

Animal Community – Wildlife Interpretations

-- Under Development --

Western Wheatgrass/Blue Grama Plant Community:

Blue Grama/Buffalograss Plant Community:

Low Plant Density Community:

Clubmoss Plant Community:

Annuals/Pioneer Perennial Plant Community

Animal Preferences (Quarterly – 1,2,3,4[†])

Common Name	Cattle	Sheep	Horses	Deer	Antelope	Bison	Elk
Grasses & Grass-likes							
blue grama	U D P U	D P P D	U D P U	D P P D	D P P D	U D P U	U D P U
buffalograss	U U D U	N U D U	U U D U	N U D U	N U D U	U U D U	U U D U
cheatgrass	U D U U	N P U N	U D U U	N P U N	N P U N	U D U U	U D U U
crested wheatgrass	U P U D	U P N N	U P U D	U P N N	U P N N	U P U D	U P U D
dropseed	N U N N	N U N N	N U N N	N U N N	N U N N	N U N N	N U N N
green needlegrass	U P U D	N P N P	U P U D	N P N P	N P N P	U P U D	U P U D
inland saltgrass	N U U N	N N N N	N U U N	N N N N	N N N N	N U U N	N U U N
Kentucky bluegrass	U D U U	U P N D	U D U U	U P N D	U P N D	U D U U	U D U U
needleandthread	U D U D	N D N U	U D U D	N D N U	N D N U	U D U D	U D U D
needleleaf sedge	U D U D	U P N D	U D U D	U D U D	U D U D	U D U D	U D U D
plains reedgrass	U D U U	N D N N	U D U U	N D N N	N D N N	U D U U	U D U U
prairie junegrass	U D U D	N D N U	U D U D	N D N U	N D N U	U D U D	U D U D
Sandberg bluegrass	N U N N	N D N N	N U N N	N D N N	N D N N	N U N N	N U N N
smooth brome	U P U U	U P U U	U P U U	U P U U	U P U U	U P U U	U P U U
thickspike wheatgrass	U D D U	N D N N	U D D U	N D N N	N D N N	U D D U	U D D U
threadleaf sedge	U D U D	U P N D	U D U D	U D U D	U D U D	U D U D	U D U D
tumblegrass	N N N N	N N N N	N N N N	N N N N	N N N N	N N N N	N N N N
western wheatgrass	U P D U	N D N N	U P D U	N D N N	N D N N	U P D U	U P D U
Forbs							
cudweed sagewort	U U U U	U U D U	U U U U	U U D U	U U D U	U U U U	U U D U
heath aster	U U D U	U U P U	U U D U	U U P U	U U P U	U U D U	U U P U
Hood's phlox	U D U U	U P P U	U D U U	U P P U	U P P U	U D U U	U P P U
Lambert crazyweed	T T T T	T T T T	T T T T	T T T T	T T T T	T T T T	T T T T
Nuttall's violet	N U N N	N U N N	N U N N	N U N N	N U N N	N U N N	N U N N
prairie coneflower	U U D U	U P P U	U U D U	U P P U	U P P U	U U D U	U P P U
rose pussytoes	U U U U	U U U U	U U U U	U U U U	U U U U	U U U U	U U U U
rush skeletonweed	U U U U	N N N N	U U U U	N N N N	N N N N	U U U U	N N N N
scarlet globemallow	U U D U	U D D U	U U D U	U D D U	U D D U	U U D U	U D D U
silverleaf scurfpea	U U U U	N U U N	U U U U	N U U N	N U U N	U U U U	N U U N
sticky cinquefoil	N N N N	N U D N	N N N N	N U D N	N U D N	N N N N	N U D N
wavyleaf thistle	U U U U	N N N N	U U U U	N N N N	N N N N	U U U U	N N N N
western yarrow	U U U U	N U U N	U U U U	N U U N	N U U N	U U U U	N U U N
wild onion	U D U U	U D D U	U D U U	U D D U	U D D U	U D U U	U D D U
wild parsley	U D U U	U D D U	U D U U	U D D U	U D D U	U D U U	U D D U
woolly Indianwheat	U U U U	N U U N	U U U U	N U U N	N U U N	U U U U	N U U N
Shrubs							
brittle cactus	N N N N	N N N N	N N N N	N N N N	N N N N	N N N N	N N N N
broom snakeweed	N N N N	U U U U	N N N N	U U U U	U U U U	N N N N	U U U U
fringed sagewort	U U U U	U U U U	U U U U	U D D U	U P P D	U U U U	U U U D
Nuttall's saltbush	P D D P	P D D P	P D D P	P D D P	P D D P	P D D P	P D D P
plains pricklypear	N N N N	N N N N	N N N N	N N N N	N N N N	N N N N	N N N N
purple pincushion	N N N N	N N N N	N N N N	N N N N	N N N N	N N N N	N N N N
rubber rabbitbrush	N N N N	D U U D	N N N N	D U U D	U D D U	N N N N	D U U U
silver sagebrush	D U U D	D U U D	D U U D	P D D P	P P P P	D U U D	D U U D
winterfat	P P P P	P P P P	P P P P	P P P P	P P P P	P P P P	P P P P
Cryptogams							
clubmoss	N N N N	N N N N	N N N N	N N N N	N N N N	N N N N	N N N N

N = not used; U = undesirable; D = desirable; P = preferred; T = toxic

[†] Quarters: 1 – Jan., Feb., Mar.; 2 – Apr., May, Jun.; 3 – Jul., Aug., Sep.; 4 – Oct., Nov., Dec.

Animal Community – Grazing Interpretations

The following table lists suggested initial stocking rates for cattle under continuous grazing (year long grazing or growing season long grazing) under normal growing conditions; however, *continuous grazing is not recommended*. These are conservative estimates that should be used only as guidelines in the initial stages of the conservation planning process and may need to be adjusted due to diet preferences of other types or kinds of livestock and/or other factors. Often, the current plant composition does not entirely match any particular plant community (as described in this ecological site description). Because of this, a field visit is recommended, in all cases, to document plant composition and production. More precise carrying capacity estimates should eventually be calculated using the following stocking rate information along with animal preference data, particularly when grazers other than cattle are involved. With consultation of the land manager, more intensive grazing management may result in improved harvest efficiencies and increased carrying capacity.

Plant Community	Production (lbs./acre)	Carrying Capacity ¹ (AUM/acre)
Western Wheatgrass/Blue Grama (HCPC)	800	0.25
Low Plant Density	650	0.20 ²
Blue Grama/Buffalograss	250	0.13
Clubmoss	200	0.10
Annual/Pioneer Perennial	-- ³	-- ³

¹ Continuous season-long grazing by cattle under average growing conditions.

² Stocking rates may need to be adjusted due to palatability and/or availability of forage.

³ Highly variable; stocking rate needs to be determined onsite.

Hydrology Functions

Water is the principal factor limiting herbage production on this site. The site is dominated by soils in hydrologic group D. Infiltration varies from moderate to very slow and runoff potential varies from medium to very high depending on soil hydrologic group and ground cover. In many cases, areas with greater than 75 percent ground cover have the greatest potential for high infiltration and lower runoff. An exception would be where short grasses form a dense sod and dominate the site. Areas where ground cover is less than 50 percent have the greatest potential to have reduced infiltration and higher runoff (refer to Section 4, NRCS National Engineering Handbook, for runoff quantities and hydrologic curves).

Recreational Uses

This site provides hunting opportunities for upland game species.

Wood Products

No appreciable wood products are present on the site.

Other Products

None noted.

Supporting Information

Associated Sites

(054XY020ND) – Clayey

(054XY021ND) – Claypan

(054XY022ND) – Closed Depression

(054XY031ND) – Loamy

(054XY027ND) – Sandy Claypan

(054XY024ND) – Saline Lowland

Similar Sites

(054XY021ND) – Claypan (Cp)

[Well drained soils on uplands or terraces that don't receive extra moisture with a dense sodic subsoil below 6 inches with salts below 16 inches. Indicator species are western wheatgrass with an understory of blue grama, heath aster, and western yarrow along with a few shrubs of fringed sagewort and Nuttall's Saltbush. This site has a deeper sodic subsoil layer, more production, similar species, less blue grama, more needleandthread and green needlegrass.]

(054XY022ND) – Closed Depression (Cd)

[Poorly drained clayey soils with sodic subsoils and with noticeable redoximorphic features within depressions. Ponds periodically with no apparent water table. Indicator species: dominated by western wheatgrass with alkaligrass and foxtail barley intermixed, forb indicator is western dock, no shrubs. This site has no blue grama but more western wheatgrass, far more production, different landscape position, with dock or smartweed, does have a sodic soil layer at similar depths and will flood.]

(054XY028ND) – Shallow Clayey (SwCy)

[Well drained soils more than 10 less than 20 inches to unweathered shales that restricts root penetration. Upslope of clayey site, surface layer will ribbon greater than two inches, upslope of clayey ecological site. Indicator species: western wheatgrass dominates with little bluestem, plains muhly, sideoats grama, and gayfeather. This site has little bluestem, plains muhly, sideoats grama, less green needlegrass, less blue grama and needleandthread, more production, different restrictive layer at less than six inches.]

(054XY035ND) – Very Shallow (VS)

[Excessively well drained soils less than 10 inches to scoria or gravels bedrock that restricts root penetration, upslope of shallow clayey, shallow loamy, or shallow sandy ecological sites. Indicator species are little bluestem, sideoats grama, blue grama, purple coneflower, pasqueflower, and creeping juniper. This site has more little bluestem, steeper slopes, similar production, and a different restrictive layer.]

Inventory Data References

Information presented here has been derived from NRCS clipping and other inventory data. Also, field knowledge of range-trained personnel was used. All descriptions were peer reviewed and/or field tested by various private, state, and federal agency specialists.

Those involved in developing this site description include: Dennis Froemke, NRCS Range Management Specialist; Jeff Printz, NRCS State Range Management Specialist; Stan Boltz, NRCS Range Management Specialist; Darrell Vanderbusch, NRCS Resource Soil Scientist; L. Michael Stirling, NRCS Range Management Specialist; Dean Chamrad, NRCS State Range Management Specialist; David Dewald, NRCS State Biologist; and Brad Podoll, NRCS Biologist.

<u>Data Source</u>	<u>Number of Records</u>	<u>Sample Period</u>	<u>State</u>	<u>County</u>
SCS-RANGE-417	0			
Ocular estimates	7	1985 – 2001	ND	Adams, Bowman, Dunn, Morton

State Correlation

This site has been correlated with Montana and South Dakota in MLRA 54.

Site Type: Rangeland
MLRA: 54 – Rolling Soft Shale Plain

Thin Claypan
R054XY033ND

Field Offices

Baker, MT	Buffalo, SD	Faith, SD	Mott, ND
Beach, ND	Carson, ND	Hettinger, ND	Selfridge, ND
Beulah, ND	Culbertson, MT	Killdeer, ND	Sidney, MT
Bison, SD	Dickinson, ND	Mandan, ND	Watford City, ND
Bowman, ND	Dupree, SD	McIntosh, SD	Wibaux, MT

Relationship to Other Established Classifications

Level IV Ecoregions of the Conterminous United States: 43a – Missouri Plateau.

Other References

High Plains Regional Climate Center, University of Nebraska, 830728 Chase Hall, Lincoln, NE 68583-0728. (<http://hpccsun.unl.edu>).

USDA, NRCS. National Water and Climate Center, 101 SW Main, Suite 1600, Portland, OR 97204-3224. (<http://www.wcc.nrcs.usda.gov>).

USDA, NRCS. National Range and Pasture Handbook, September 1997.

USDA, NRCS. National Soil Information System, Information Technology Center, 2150 Centre Avenue, Building A, Fort Collins, CO 80526. (<http://nasis.nrcs.usda.gov>).

USDA, NRCS. 2001. The PLANTS Database, Version 3.1 (<http://plants.usda.gov>). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.

USDA, NRCS, Various Published Soil Surveys.

Site Description Approval

State Range Management Specialist

Date

State Range Management Specialist

Date

State Range Management Specialist

Date